MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
SOUTH CENTRAL REGIONAL OFFICE
WATER DIVISION

7705 Timberlake Road Lynchburg, VA 24502

SUBJECT: MECKLENBURG COGENERATION, VPDES PERMIT # VA0084069, TOXICS MANAGEMENT PROGRAM (TMP) - TECHNICAL DATA REVIEW

TO: Bob Goode, Water Permits Manager - SCRO

FROM: Kirk Batsel, Sr. Environmental Engineer - SCRO

DATE: May 23, 2005

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General Background

The subject facility is a 132 megawatt coal-fired steam electric power plant located in Clarksville, Virginia. The facility discharges process wastewater, consisting of cooling tower and boiler blowdown, coal pile runoff, demineralizer regeneration wastes, filter media blowdown, and miscellaneous plant sumps, to the John H. Kerr Reservoir via outfall 001. The reservoir is classified as a Public Water Supply (PWS). The current VPDES permit contains a TMP special condition which requires annual invertebrate acute and chronic toxicity testing. The existing TMP was written with endpoints of 1.0 TUa (>100% effluent) for acute toxicity and 50.0 TUc (NOEC = 2.0% effluent) for chronic toxicity.

The facility conducted and submitted a site-specific mixing zone analysis, dated July 30, 2002 (revised August 23, 2002). This study was generated to address pending chemical-specific effluent limitations. However, the results also apply to the evaluation of whole effluent toxicity test data. The study was approved by DEQ (A. Brockenbrough, OWPP) by memorandum dated January 9, 2003. The study approval indicated a mixing ratio of 3.9 at the mouth of the cove, 120 feet from the outfall, for application of chronic and human health WLA's. The approval also indicated an acute mixing ratio of 2.0 at 40 feet from the outfall.

The fact sheet for the current permit indicates that the annual testing required in the current permit is a continuation of reduced monitoring from the previous permit cycle (1995-2000). Historical acute toxicity test data is included in Table 1 and historical chronic toxicity test data is presented in Table 2. As required by the current permit, the facility continued annual acute and chronic tests during the current permit cycle (2000-present). This data has been evaluated and in also included in Tables 1 and 2.

Data Summary

A total of five acute tests and five chronic tests were conducted and reported by the permittee during this permit term. All tests utilized C. dubia as the indicator organism and all were considered valid. Each of the tests utilized 24 hour flow-proportioned composite samples of effluent from outfall 001. Results of all acute toxicity tests evaluated in this technical review are presented in Table 1 and chronic tests are presented in Table 2.

Table 1. (Acute Toxicity Tests – Outfall 001)

Test Date	Test Organism	LC_{50} (%)	% Survival in 100% effluent	Testing Laboratory
01/93	*C. dubia*	>100	95	Olver
01/93	*P. promelas*	>100	100	Olver
6/93	*C. dubia*	>100	100	Olver
6/93	*P. promelas*	>100	100	Olver
8/93	*C. dubia*	>100	100	Olver
8/93	*P. promelas*	>100	100	Olver
11/93	*C. dubia*	>100	100	Olver
11/93	*P. promelas*	>100	100	Olver
01/94	*C. dubia*	>100	100	Olver
01/95	*C. dubia*	>100	100	Olver
02/96	*C. dubia*	>100	100	Olver
02/97	*C. dubia*	>100	100	Olver
01/98	***C. dubia***	**71.9**	**40**	**Olver**
02/98	*C. dubia*	>100	95	Olver
01/99	*C. dubia*	>100	100	Olver
01/00	*C. dubia*	>100	100	Olver
10/00*	*C. dubia*	>100	100	Olver
10/01*	*C. dubia*	>100	90	Olver
10/02*	*C. dubia*	>100	85	Olver
11/03*	*C. dubia*	>100	100	ProChem
10/04*	*C. dubia*	>100	100	Olver

* Tests reviewed during this technical data review.

Table 2.

Test Date	Vertebrate NOEC%/TUc Value	Invertebrate NOEC%/TUc Value	% Survival in 100% Effluent	IC25 as %	Endpoint
1/21/93	100% TUc=1.0		93%	NA	NA
9/09/93		100% TUc=1.0	100%	NA	NA
6/24/93	100% TUc=1.0		100%	NA	NA
6/24/93		100% TUc=1.0	98%	NA	NA
8/24/93	100% TUc=1.0		98%	NA	NA
8/24/93		100% TUc=1.0	90%	NA	NA
11/2/93	100% TUc=1.0		98%	NA	NA
11/2/93		**12.5% TUc=8.0**	**70%**	**NA**	**ND**
1/19/94		**12.5% TUc=8.0**	**80%**	**NA**	**ND**
1/24/95		100% TUc=1.0	100%	NA	NA
2/6/96		**12.5% TUc=8.0**	**100%**	**NA**	**ND**
2/7/97		100% TUc=1.0	100%	NA	ND
2/10/98		**12.5% TUc=8.0**	**0%**	**NA**	**ND**
1/14/99		**<1% or 12.5% TUc=>100 or 8.0****	**90%**	**NA**	**ND**
3/16/99		**12.5% TUc=8.0**	**100%**	**NA**	**ND**
1/18/00		100% TUc=1.0	100%	NA	ND
10/10/00		100% TUc=1.0	100%	NA	ND
10/16/01		**25% TUc= 4.0**	**90%**	**>100%**	**REPRODUCTION**
10/23/02		**2% TUc= 50.0**	**70%**	**7.1%**	**REPRODUCTION**
11/7/03		**2% TUc= 50.0**	**100%**	**11.4%**	**REPRODUCTION**
10/5/04		**51% TUc= 1.96**	**90%**	**96%**	**REPRODUCTION**

All tests conducted by Olver, except 11/03 completed by ProChem.
NA = Not Available, ND = Not Determinable

* Tests reviewed during this technical data review.

** Reproduction data exhibited a non-continuous dose-dependent response to effluent. Statistically significant effects on reproduction were detected at 100% and 1% effluent; however, 2%, 6.25%, and 12.5% concentrations were not significantly affected. 12.5% NOEC determined based on organism response in 2-12.5%.

Discussion

Acute toxicity tests generated during the current permit term all resulted in LC50 values > 100% effluent. Only one (1/1998) of the 21 acute toxicity tests conducted using outfall 001 effluent has resulted in a definitive LC50 value. As a result, the facility is considered to have passed the acute toxicity endpoint during the current permit term.

The basis for the current TMP was reviewed and analyzed during this technical review, and at this time, it is not clear why the current permit established a chronic endpoint of 2% effluent (NOEC $\geq$ 2%). In accordance with agency guidance, and in lieu of site-specific mixing information, normal chronic endpoints would have specified an endpoint of 100% effluent. However, since the current TMP specifies an endpoint of 2% for chronic toxicity tests, compliance of the tests conducted during the previous permit term were evaluated based on an endpoint of 2% effluent. Since November 1993, several of the chronic tests using outfall 001 effluent have resulted in NOEC values <100% effluent. During the current permit term, four (4) of the five (5) tests conducted resulted in NOEC values <100%. Both, the 2002 and 2003 chronic tests, resulted in NOEC values of 2%. Sub-lethal chronic effects were noted based on the *Reproduction* endpoint in all of these tests. Definitive IC25 endpoints were also determined for the last three chronic tests.

As previously mentioned, the facility completed a site-specific mixing zone analysis during this permit term. This now provides a more exact determination of mixing for outfall 001 and provides the information necessary to assign an appropriate chronic endpoint. Based on this information, TMP endpoints would be established at NOAEC = 100% for acute toxicity and NOEC of 18% for chronic toxicity. Based on this, data generated to date have been evaluated using these endpoints and, in accordance with agency procedure, statistically analyzed to determine the need for a Whole Effluent Toxicity (WET) limitation. See attached STATS.exe printout for the results of this statistical analysis. If only data generated from the existing permit term were analyzed, a slightly different endpoint would be calculated, based primarily on the use of a given coefficient of variation (CV) assigned to datasets with <10 datapoints. In this case, it is considered appropriate to use the larger dataset which establishes a CV based on the discharge-specific effluent data.

Based on the statistical analysis of the chronic toxicity test data, a WET limitation is needed based on Chronic Toxicity. This endpoint is established as 5.4 TUc or an NOEC = 18.5% effluent. The facility should be afforded a compliance period not to exceed 4 years to meet this new limitation.

Conclusions/Recommendations

1) Part I.A. of the permit should include the WET limitation of 5.4 TUc (NOEC = 18.5% effluent).

2) The attached WET limitation special condition and compliance schedule should be included in the reissuance permit.

B. WHOLE EFFLUENT TOXICITY (WET) LIMITATION MONITORING REQUIREMENTS FOR OUTFALL 001.

1. Whole Effluent Toxicity (WET) Limitation and Monitoring Requirements

   a. The Whole Effluent Toxicity limitation of 5.4 TU_c (NOEC $\geq$ 18.5%) in Part I.A. is a final limit with an effective date of August 10, 2009.

   b. Commencing within one (1) month of the effective date of the limit, the permittee shall conduct quarterly chronic toxicity tests using 24-hour flow-proportioned composite samples of final effluent from outfall 001. The chronic tests to use are:

      Chronic 3-Brood Static Renewal Survival and Reproduction Test using *Ceriodaphnia dubia*
      Chronic 7-Day Static Renewal Survival and Growth Test using *Pimephales promelas*

      These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and reproduction. The test endpoint (limit) must be represented by a dilution, and if other than 100%, should be bracketed by at least one dilution above and one dilution below it. Express the test NOEC as TU_c (Chronic Toxic Units), by dividing 100/NOEC for DMR reporting. The IC_{25} should be included on the submitted test reports. Two copies of the toxicity test results shall be submitted with the DMR. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3

   c. If after a minimum of four quarters of tests have been reviewed, it is determined that tests with one of the species in 1.b. meets the criterion below, testing may be reduced to using only one species:

      Survival of $\geq$ 80% of the organisms in 100% effluent in each of the tests considered, and the secondary NOEC endpoint for reproduction or growth is an NOEC = 100% effluent.

   d. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limits must control the toxicity of the effluent.

C. SCHEDULE OF COMPLIANCE

The permittee shall achieve compliance with the final limitations and monitoring requirements for Whole Effluent Toxicity as specified in Part I.A. of this permit in accordance with the following schedule:

1.	Submit Proposed Plan for Achievement of Compliance or Select a Design Engineer	**No later than December 10, 2005**
2.	Submit Progress Reports to the DEQ Regional Office	**Quarterly after #1, with the first report due April 10, 2006.**
3.	Achieve Compliance with Part I.A. Limitations	**No later than August 10, 2009.**

Quarterly = In accordance with the following schedule: 1st quarter (January 1 - March 31, **due April 10**); 2nd quarter (April 1 - June 30, **due July 10**); 3rd quarter (July 1 - September 30, **due October 10**); 4th quarter (October 1 - December 31, **due January 10**).

No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit to the DEQ Regional Office, either a **report of progress** or, in the case of specific actions being required by identified dates, a written **notice of compliance or noncompliance**. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.